Chapter Twelve

Computer Applications

12.1 INTRODUCTION

The Bridge and Project Development Sections share many of the same computer applications, utilizing common servers and maintaining a common project file database and graphic standards. The Quality Section and OIT are the lead sections in operating, maintaining, and administering common computer equipment and application practices of both sections. (For further information on computer applications and graphic standards, refer to the *Project Development Manual*.)

12.2 SOFTWARE APPLICATIONS

Computer applications assist in the design of highways and bridges by automating tasks and increasing productivity. All design work is produced in a CADD environment with a number of design software packages. Software ranges from graphics products for producing design plans, to structural analysis packages for the design of bridges. Designers must exercise engineering judgment when using computer applications. They must understand the physical principles involved, how their computer applications apply those principles, how to model the computer input, and how to interpret the computer output. Use of a computer program and its results does not relieve the engineer of full responsibility for the design.

12.2.1 SOFTWARE APPROVAL

The Bridge Design section maintains a list of software acceptable for use on Department bridge projects; however, the results of pre-approved software, and any others that may be approved in the future, shall only be used for analysis and design when:

- All computer work is under the direct supervision of an experienced engineer familiar with computer techniques.
- The designer assumes responsibility for the logic and results of the program.

Software that is not on the Department's approved list should not be used in design calculations or plan preparation unless approved for use by the Bridge Design Engineer. To obtain approval for use of other software design programs, documentation of the computer programs shall be submitted to the Department for approval. This submission shall include information which would be required by an engineer to determine what methods were used in the solution of the problem and what assumptions were used in the calculations. The submission should include the following as a minimum:

- A description of the program, explaining exactly what it does, what options are

available, and what methods are used. Submission of a flow diagram is recommended.

- The input required by the program, including a description of each value, an input form (if one is used), and sample input.
- The program output, including a complete description of each value, any keys used in interpreting the output, and sample output from the sample input.
- Any constants or parameters used in the program.
- An explanation of how the program was checked, including a copy of computations relative to test.

Approval only allows the designer to include computer input and output in the design calculations. It does not relieve the designer of responsibility for assuring that the program is satisfactory for the intended use and performing properly. No further approval is required for any program unless modifications are made to the program logic. When computer output is included in a set of computations for submission, a copy of the input necessary to interpret the data should also be included.

Documentation for previously approved programs need not be submitted for each new project. However, the designer shall include a letter indicating which version of each program was used in the project, along with the date of the prior approval.

A program that can be used for generating the Reinforcing Bar List sheets in MicroStation for the construction plans is available from the Bridge Design section.

12.3 COMMON STANDARDS

Common computer applications software standards utilized by both Project Development and Bridge Design are contained in the DelDOT Project Development Manual. They include:

- graphic standards;
- seed files;
- drafting software;
- survey software;
- roadway design software;
- plotting standards;
- design visualization software;
- common raster imaging software;
- traffic analysis software;
- project management.

12.4 COMPUTER FILE ADMINISTRATION

12.4.1 FILE MANAGEMENT

A file management system has been implemented at DelDOT to manage the location, access, distribution, backup, and archiving of data critical to the Department's design and maintenance programs. File naming conventions and file management procedures shall conform to DelDOT standards.

12.4.2 AS-BUILT PLANS

The procedure for preparation of as-built plans shall be as directed Chapter 13 of this manual.

12.4.3 ARCHIVES

Records of Bridge Design Projects shall be maintained in accordance with the

Department's *Policy Implement A-30, Records Management Policy*.

12.4.4 CONSULTANT CADD REQUIREMENTS

Electronic file copies usually improve efficiency in organization and archiving. For this reason, the Bridge Design Section is transitioning to a requirement that consultants provide electronic versions of everything they produce.

For each plan submission, consultants shall, at a minimum, provide the Department with one set of full-size paper copies of the plans and an electronic copy of the cal files that can be used for mass reproduction of the plans for review and comment.

When the project is complete, consultants shall provide copies of the final dgn files, and digital terrain model (DTM). As-built information provided by the District shall be transferred to the electronic version of the plans by the design consultant, and cal files shall be prepared and provided to the Department for final archiving.

Consultants shall also provide an electronic copy of all reports that they prepare. Reports shall be prepared using MS Word.

12.5 MISCELLANEOUS RESOURCES

Various other sections of the Department maintain computer applications used by bridge designers and provide support services. Some of these are listed below.

12.5.1 OFFICE OF INFORMATION TECHNOLOGY (OIT)

OIT is charged with providing information and computer support to the Department. OIT is responsible for day-to-day technical support for all users within the Department and maintains computer operations seven days a week.

12.5.2 SPECIAL PROVISIONS

Special Provisions may be needed on projects for non-standard items. Existing special provisions are sometimes modified and completely new ones may be created. Designers involved in writing special provisions should refer to the latest copy of the DelDOT's *Format for Special Provisions File Requirements* from the Specifications Engineer. Numerous versions of special provisions may be available.

12.5.3 PLANNING

Planning is charged with Mapping and Geographic Information Systems. These are used for a variety of purposes, including:

- Assessment of land use and projected growth
- Traffic count information
- Accident history
- Infrastructure inventories

12.5.3.1 Mapping

Mapping provides cartography, and produces and updates the state road maps. These maps are used by designers to study the roadway system's geographic features and existing and future development. Maps can be accessed electronically.

12.5.3.1.1 Geographic Information System (GIS) INFORM

INFORM provides information such as accident history, traffic counts, bridge location, aerial photography, and other information. It ties electronic mapping and database applications together.